

# WHAT IS SUSTAINABILITY?

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*A Burnaby ESS Context Report  
(Discussion Paper 1b)*

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Burnaby  
Environmental  
Sustainability  
Strategy

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## 1. Introduction

Burnaby has already made significant strides toward sustainability. The *Environmental Sustainability Strategy (ESS)* will build on past successes, and chart a course for the future based on an integrated sustainability framework that complements the *Economic Development Strategy* (2007) and the *Social Sustainability Strategy* (2011).

Human communities have always been shaped by their environment. We have never faced a greater need to call on ingenuity and compassion to address global, regional and local challenges. These challenges may seem overwhelming and impossible to manage for an individual or even a community. Yet this is exactly the scale at which profound change is occurring.

Across the world, motivated individuals, groups, businesses and local governments are getting together to envision and create a world that is cleaner, healthier, and more just. Challenges can be transformed to opportunities if current positive trends are combined with strategic actions. This is what the ESS is all about.

The purpose of this report is to inspire and stimulate a conversation about sustainability among community members, the ESS Steering Committee, and other key partners who have a stake in the future of Burnaby, as part of the *Community Dialogue Approach* to developing the ESS. The report describes some principles and tenets of sustainability, highlights some key challenges and opportunities, and outlines a proposed framework for considering the many different aspects of environmental sustainability in Burnaby.

A companion report, “*Burnaby’s Environmental Achievements – a Burnaby ESS Context Report*”, provides an overview of some of Burnaby’s achievements to date in environmental protection and enhancement.

Together, these two initial reports have been prepared by the City in order to stimulate an exchange of ideas, as the first step in the ESS process. These reports are being made available to the Steering Committee, and will subsequently be posted on the City’s website ([www.burnaby.ca/ess](http://www.burnaby.ca/ess)). Steering Committee members are encouraged to provide feedback to this report, the Steering Committee presentations and discussion at the Steering Committee using the separate electronic feedback form which will be provided following the 1<sup>st</sup> Steering Committee meeting. These responses will be recorded and used to help guide the formation and direction of the ESS. In order to conserve paper, limited hard copies of this report will be made available, and participants are requested to use the electronic feedback forms.



## 2. Background:

### Human Communities and the Environment - Our Challenge

Human communities have always been shaped by their environment. The success or collapse of entire societies has been attributed to environmental factors, which also had a profound effect on how these societies developed.

<p>The <b>environment</b> is <u>our surroundings</u>, which sustain us and all other species and ecosystems on earth – it includes the air, earth, water, and built environment.</p>	<p>An <b>ecosystem</b> consists of diverse living <u>organisms</u> interacting with each another and with their <u>environment</u>. Ecosystems can exist at many different scales, from the micro-organisms that live in our gut to the Great Barrier Reef. Some of the main large-scale ecosystems in Burnaby are described in <b>Appendix A</b>.</p>
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Today our technology and lifestyle choices can create the illusion that we are separate from the natural world. However, whether we notice them or not, we remain dependent on healthy, functional ecosystems for our survival and well-being. For example, healthy forests, streams and wetlands provide us with high quality drinking water; plants produce oxygen and filter out air pollutants; and insects pollinate a large percentage of our food crops. Often natural systems can provide the most cost-effective solutions to perform these services, whereas replacing them with technology is typically cost-prohibitive and often impossible.

The Environmental Sustainability Strategy addresses one of our most important challenges as a community: *how can we best care for these ecosystems and our environment, which are critical for our own health and prosperity in addition to the well-being of generations to come?*

#### The Value of Ecosystem Services

- By protecting natural ecosystems that purify drinking water in the Catskill/Delaware Watershed, New York City saved over \$4 billion that would have been necessary to construct a filtration system.<sup>1</sup>
- Trees in the City of Toronto were estimated to provide the equivalent of \$60 million per year in ecosystem services, including capturing/storing carbon, conserving energy (heating/cooling in buildings), improving air quality and reducing stormwater runoff.<sup>2</sup>

<sup>1</sup> Daily and Ellison, 2002: The new Economy of Nature – the Quest to Make Conservation Profitable. Washington DC. Island Press.



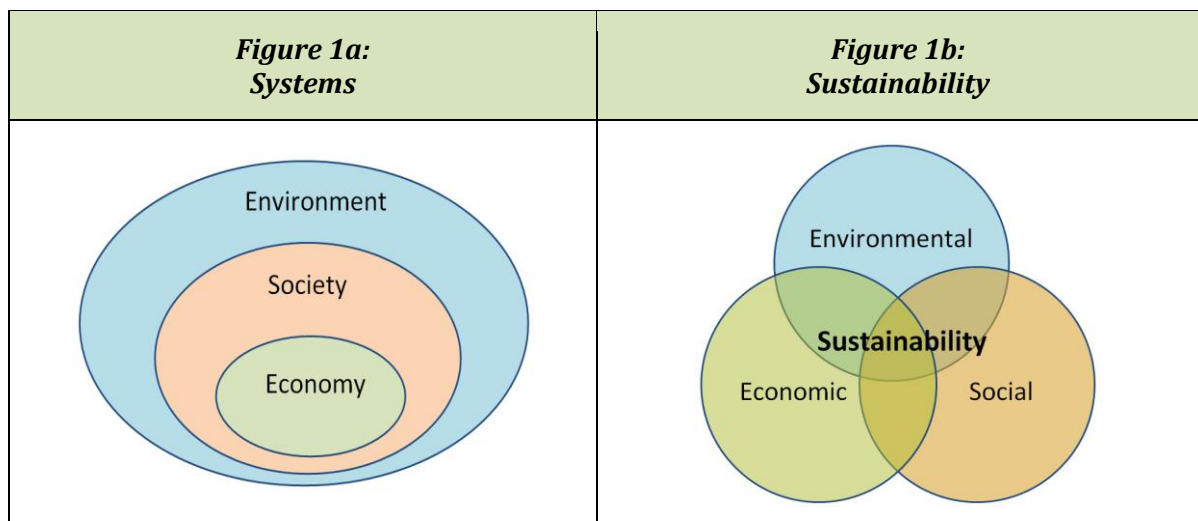
### 3. What is Sustainability?

#### 3.1. Concepts and Definitions

Sustainability has many different definitions. In general terms it is **the long-term persistence of a thing or a system.**

Sustainability is not an *end-state*, rather it is a *process* of continuous, ongoing learning, improvement, and a realignment of community goals and practices, to be more healthy, *livable*<sup>3</sup> and *resilient*<sup>4</sup>.

Sustainability is usually understood to encompass three interrelated systems: the environment, society and the economy, which are functionally nested one within the other, as shown in the diagram on the left (**Figure 1a**). Sustainability itself can be represented as the area in which these three components overlap, as shown in the diagram on the right (**Figure 1b**).



#### 3.2. The Ecosystem Model of Sustainability

Modern (post-industrial) society has existed for only a very short time, whereas most ecosystems have persisted for thousands of years. Therefore, it is sensible to look to natural ecosystems as a model of sustainability.

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<sup>2</sup> City of Toronto, 2010: Every Tree Counts – a Portrait of Toronto’s Urban Forest.  
[http://www.toronto.ca/trees/every\\_tree\\_counts.htm](http://www.toronto.ca/trees/every_tree_counts.htm)

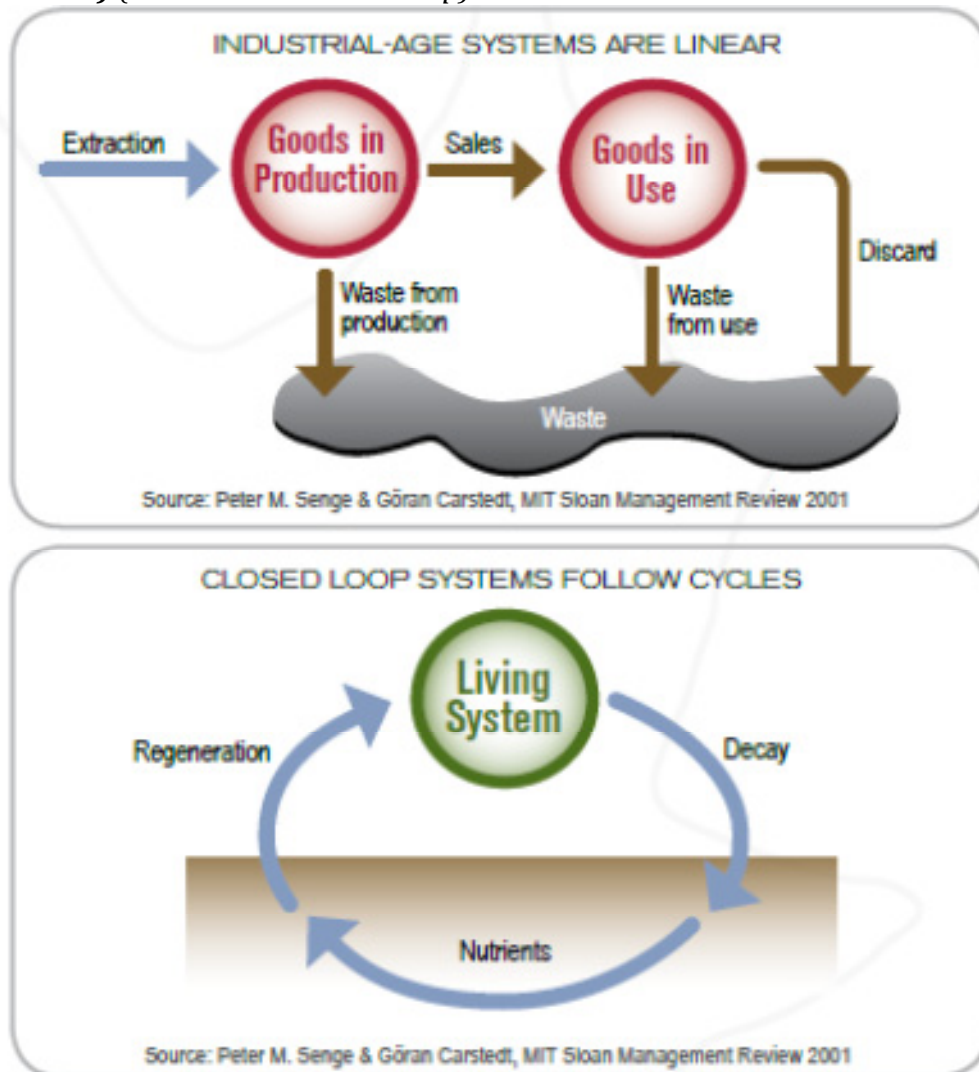
<sup>3</sup> Livability refers to the quality of life enjoyed by the people living in a community.

<sup>4</sup> Resilience is defined as the capacity of an ecosystem to withstand shocks and disturbances and rebuild itself; and in social systems resilience has the added dimension of human capacity to anticipate and plan for the future (<http://www.resalliance.org>).



Every other species on this planet produces no “waste;” instead, outputs from one organism become resources for another, creating a ‘virtuous cycle’ and maintaining healthy ecosystems. Diverse species co-exist within beneficial relationships: trees provide homes and food for birds; predators help keep prey populations in check; invertebrates and microbes on the forest floor convert leaves into rich soil for plants. This entails a cyclical process, as shown in **Figure 2 (bottom)**. In contrast, ‘conventional’ human systems typically have a “one use” or “once through” flow of resources, resulting in the discharge of waste with harmful impacts to other species. This is illustrated in **Figure 2 (top)**.

**Figure 2. “Once through” human cycles (top) vs. closed-loop natural cycles (bottom)** (source: *The Natural Step*)

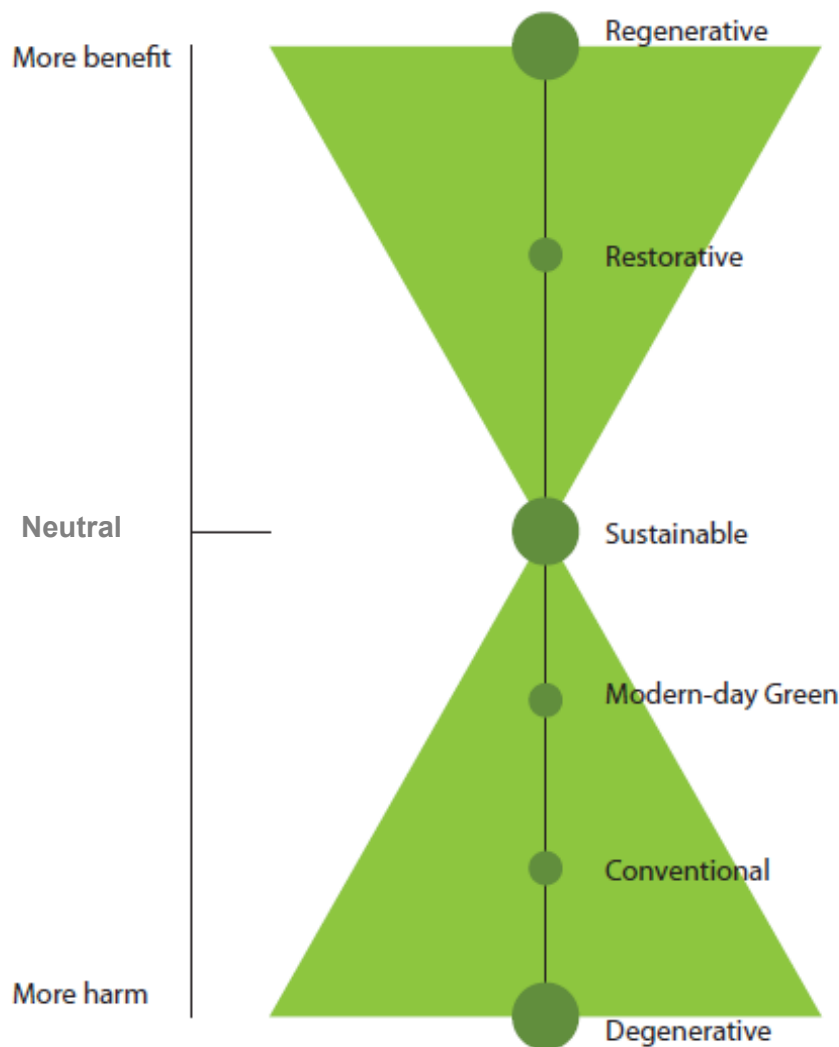


Building on the ecosystem model, a **regenerative approach** aspires to move forward in a manner that heals the natural environment.

This goes beyond sustaining the status quo – a combination of ‘conventional’ design with no special environmental attention, and standard ‘green’ approaches (for example, most ‘green’ building designs), which focus on *reducing* negative impacts but still cause harm. Instead, regeneration occurs when we go beyond the point of equilibrium of ‘no harm’ and actually create a net benefit or enhancement to the environment. This is how ecosystems work. **Figure 3** illustrates this continuum from a degenerative to a regenerative approach.

True sustainability depends on how well we can model human communities and systems on this principle, to avoid ecosystem degradation, and ensure healthy and sustainable communities for generations to come.

**Figure 3. A regenerative/degenerative continuum**  
(after Pluut et al., 2012)



### 3.3. Elements of a Sustainable Community

Using the principles of healthy ecosystems outlined above, we can start to define the attributes of a sustainable community.

Generally speaking, a sustainable community:

- reduces and eventually eliminates the use of non-renewable resources (e.g. fossil fuels);
- reduces and eventually eliminates the discharge of harmful substances to the environment (e.g. air, ground and water pollution; greenhouse gas emissions);
- restores natural energy and resource cycles (water, nutrients, soil, carbon);
- adapts to the impacts of a changing climate;
- reduces consumption and eventually eliminates waste;
- protects and restores functional ecosystems and biodiversity; and
- ensures people have the capacity to meet their needs.

### 3.4. Integrated Sustainability

Recognizing the intrinsic linkages between the environment, society and the economy allows us to capitalize on the opportunities that enhance all three dimensions of our world. Cities with exceptional environmental quality also position themselves as places where people want to live and do business. At the same time, environmental initiatives must also reflect the economic, social and cultural context of the community.

The ESS will focus primarily on the “environmental” dimension of sustainability, but will also integrate the social and economic visions and opportunities for co-benefits identified in these completed strategic plans, as summarized in **Figure 4**. The vision statements of the Economic and Social strategies clearly recognize the inherent overlap between the three sustainability dimensions.



#### **Curitiba, Brazil – a Case Study of Place-based, Integrated sustainability**

In the 1970s, Curitiba suffered from high rates of poverty, traffic congestion and pollution. Despite severe social and economic challenges and a population increase of 300%, Curitiba has since achieved a recycling rate of 70%; converted downtown streets to the world’s largest pedestrian mall; converted waste areas and canals to parks that also manage stormwater and reduce flooding; and engaged citizens in beautification by offering tokens for bus tickets and food in exchange for rubbish collected. With a highly efficient and cost effective Bus Rapid Transit system used by 85% of residents, combined with extensive cycling networks, car traffic has been reduced by 30%. A number of other programs have reduced homelessness and improved education, through close collaboration with citizens. Today, the average income is 66% greater than the national average, the city has been named the best place to live in Brazil, and in 2010 Curitiba was awarded the Globe Sustainable City Award.





**Figure 4. Burnaby's complementary sustainability strategies**

 <p><b>Burnaby Social Sustainability Strategy (2011)</b></p>	 <p><b>Burnaby Economic Development Strategy 2020 (2007)</b></p>
<p><b>Vision Statement:</b></p> <p>Our Burnaby is...</p> <ul style="list-style-type: none"> <li>• Caring, inclusive and vibrant,</li> <li>• Safe, livable and just,</li> <li>• Environmentally healthy, and</li> <li>• Economically vital.</li> </ul> <p>We embrace diversity, celebrate culture and creativity, foster belonging and participation, and adapt well to a changing world.</p>	<p><b>Vision Statement:</b></p> <p><i>Smart, prosperous, sustainable...this is Burnaby's vision for the future of its local economy. Smart in the sense of an intelligent, practical approach to encouraging economic growth that contributes to a strong community; prosperous in the sense of creating economic opportunity for business and citizens; sustainable in the sense that growth is consistent with Burnaby's goals for quality of environment, community, and life.</i></p>

## 4. Challenges and Opportunities

As a society and a community, we face significant global, regional and local challenges to sustainability. Yet inherent in these challenges there are also many opportunities for improving livability and reducing costs associated with existing conditions. Some examples are briefly described below, and additional details are included in **Appendix B**.

### 4.1. Governmental Leadership

#### *Challenges*

- National and international leadership is lacking for many environmental concerns.
- Environmental protection and other services are downloaded to local government.
- Local government jurisdiction and resources are limited.

#### *Opportunities*

- Municipalities are emerging as champions of sustainability worldwide.
- Municipalities can directly control and/or regulate many key factors in sustainability, including land use and urban development, transportation, environmental protection and waste management.



- Municipalities can set the stage to draw in and engage other levels of government in pursuing locally developed solutions and approaches.
- Municipalities have close connections with citizens, enabling direct engagement, communication and education.
- Municipalities can build partnerships with the community and other levels of government to increase capacity and leverage resources and strengths.
- Complementary, multi-purpose infrastructure and services can help scarce tax dollars go further (e.g. complete streets, integrated with greenways and vegetation provide recreation and enhance the public realm, help to manage rainwater, connect ecosystems, capture carbon and improve air quality).

## **4.2. Ecosystem Health and Biodiversity**

### *Challenges*

- A majority of the world's ecosystems are critically impaired in the ability to perform services critical to humanity.
- Biodiversity – the variety of species and their habitats – is challenged by climate change, habitat loss, pollution, over-hunting/fishing and introduced alien species.
- Current rates of species extinction greatly exceed the 'natural' or background rates.
- Burnaby's ecosystems are subject to habitat fragmentation, and damage from past land use and invasive species.

### *Opportunities*

- Build on and showcase on past successes.
- Enhance and restore ecosystems as a part of new development.
- Restore lands contaminated by historical activities ("brownfields") through re-development.
- Partner with community groups, businesses, other government agencies, to capitalize on opportunities for key ecosystem restoration.

## **4.3. Increasing Consumption and Population, Resource Scarcity**

### *Challenges*

- Canadians consume more resources per person than people in most other countries, exceeding the capacity of the planet to regenerate resources and ecosystem services.
- Global population is expected to reach nearly 9 billion by 2050.
- 870 million people do not get enough food to be healthy and lead an active lifestyle.
- Locally, we rely heavily on imported materials, products and food, making us vulnerable to disruptions and commodity price increases.



### *Opportunities*

- Encourage lifestyle change to reduce consumption, support local production/jobs, purchase ethically, and reduce waste.
- Local purchasing and production initiatives can also stimulate the local economy, and improve the security of our resource and product supplies.
- Continue to improve waste reduction and recycling.

## **4.4. Energy and Fossil Fuels**

### *Challenges*

- Urban systems rely heavily on fossil fuels (coal, oil and natural gas), finite resources.
- Fossil fuels must be transported long distances, creating challenges for safety, environmental risk and economic security.
- Burning fossil fuels releases greenhouse gases (contributing to climate change) and causes air pollution and related health concerns.

### *Opportunities*

- Reduce fossil fuels with low-carbon transportation (walking, cycling, transit) – can also save money, improve health, reduce health-care costs and improve livability.
- Improving energy efficiency in older buildings reduces energy demand and costs, and improves comfort.
- Reduce energy demand with programs to encourage conservation.
- Look for opportunities to transition to renewable energy.

## **4.5. Climate Change**

### *Challenges*

- Greenhouse gas (GHG) emissions are contributing to a changing climate.
- Global effects include warming average temperatures, rising sea levels, increasing severity of extreme weather events, and stresses on ecosystems, agricultural systems and species.
- Regionally, we expect to see more extreme weather (rainfall/drought/wind and snow storms); increased flooding; ecosystem stress; drinking water supply impacts; health impacts; costs of infrastructure upgrades and repairs; immigration from more severely affected regions of the world.

### *Opportunities*

- Investigate and implement renewable energy to reduce GHG emissions and improve air quality, livability and economic security.
- Implement decentralized ‘green’ systems (e.g. *rain gardens*) to help manage increased rainwater runoff, replenish groundwater, filter pollutants and enhance the urban streetscape, helping to increase resilience to climate change.



- Develop and expand low-carbon transportation options to reduce GHG emissions, and improve air quality, health and livability.
- Manage and enhance urban forests to: help capture/store carbon; provide shade, cooling and wind buffering; save on building energy costs; manage stormwater; improve livability.

#### **4.6. Advances in Technology**

##### *Challenges*

- Electronic devices are difficult to re-use/recycle, and increase electricity use.
- Manufacturing processes can generate toxic wastes and pollution; often carried out overseas in countries with weak environmental and social regulations.

##### *Opportunities*

- Technologies and processes can help to transition to a ‘no waste’ society, e.g. manufacturing and recycling processes, electric vehicle technology, waste treatment systems, and internet and social media.
- Web-based and “cloud”-based internet technologies, tablets and smart-phones can reduce computer hardware requirements, reduce the need for commuting/travel and improve operational efficiencies (e.g. programmable heating/cooling).
- Encourage local high-technology industries and businesses.

#### **4.7. A Globalizing Economy and Society**

##### *Challenges*

- Goods are often produced far from the destination markets, in conditions that exploit weak local regulations for human welfare and environmental protection.
- Local risks: losing jobs to outsourcing; disruptions in consumer goods supply chains; increasing economic disparity; disruptions in global financial markets.

##### *Opportunities*

- Developing and promoting locally produced goods and services – also builds local capacity and can also reduce GHG emissions and other environmental impacts associated with long-distance shipping.
- Expanding social interconnections via social media – allows knowledge sharing, citizen empowerment.

#### **4.8. Urbanization**

##### *Challenges*

- More than half of the world’s population now lives in cities.
- Cities are responsible for a large percentage of resource use and greenhouse gas emissions, contributing to ecosystem degradation and climate change.



- Constrained resources and land use challenges, including waste management, pollution and transportation.
- Poorly regulated development can lead to inefficient urban structure (“sprawl”), increased greenhouse gas emissions, and the loss of critical ecosystems.

#### *Opportunities*

- Cities also represent hubs of creative power and innovation.
- With good planning, key ecosystems can be preserved and enhanced, including within the fabric of highly urban areas as well as in lower density areas.
- Close connections between citizens, community, government/institutions and business create powerful opportunities for collaboration.

### **4.9. Local Population Growth and Demographic Changes**

#### *Challenges*

- A growing population leads to increased load on systems such as waste management, transportation, parks and natural areas.
- Changes in population age profile, and family size challenge current programs, services and infrastructure.

#### *Opportunities*

- Population growth and densification can occur in appropriate areas, reducing regional development footprints while creating a more vibrant city.
- New development offers opportunities to provide a range of housing types and to improve accessibility and quality of parks and recreational facilities.
- Transit-oriented development reduces environmental footprint of transportation; improves accessibility and quality of life.



## 5. Petals (Themes) of Environmental Sustainability

A regenerative framework for environmental sustainability can be illustrated with the concept of nine petals which holistically embrace the elements of a healthy city: *live, move, green, build, flow, conserve, breathe, prosper, and manage*, as shown in **Figure 5**. Illustrative examples of initiatives from around the world are provided for each petal. There are many different ways to organize the wide range of topics connected with sustainability – this framework provides a starting point, for consideration by the Steering Committee.

**Figure 5. A Proposed Sustainability Framework**



### 5.1. Live: Land use and neighbourhood design

Compact, mixed use, walkable neighbourhoods reduce our environmental footprint while helping create a healthier, vibrant community. This pattern provides more opportunity to heal degraded ecosystems, preserve natural habitat, and support active transportation.

#### “The BLVD” - Lancaster, California



As part of an economic revitalization strategy and through extensive citizen engagement, Lancaster Boulevard was transformed from a downtown neighbourhood in decline, into a vibrant and prosperous mixed-use centre with public open space and a mix of housing types. Wider sidewalks, drought-tolerant landscaping for shade and shelter, benches, and mid-block crossings, encourage visitors and residents to walk or bike. The BLVD Transformation has yielded 48 new locally owned businesses and over 1,900 jobs. Now, people can walk

from their homes to eat a meal, attend a concert, ride a commuter train that takes them to jobs in Burbank or Los Angeles, buy groceries in a local farmers’ market, or play in a park. The city estimates that the project has resulted in \$273 million in economic output and \$130 million in private investment. The BLVD was overall winner of the EPA’s 2012 Smart Growth Award.<sup>5</sup>

### 5.2. Move: Transportation system and mode choice

Transportation systems have a major influence on the livability and quality of the environment. Traffic noise, automobile collisions, air pollution, street lighting and heat island effects of pavement and parking lots affect the quality of the built environment as well as the health of local ecosystems, wildlife and people. Greenhouse gas (GHG) emissions and air quality are strongly associated with vehicle fuel consumption. Promoting a mode shift to preferentially choose walking, cycling and transit over single automobile use is strongly associated with higher levels of livability and lower levels of environmental harm.

Physical fitness is also linked to our transportation choices – walking, cycling and other “active transportation” modes can reduce obesity and improve levels of cardiovascular fitness. It can improve mental health and provide opportunities for interacting with our neighbours and the environment.

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<sup>5</sup> [http://www.epa.gov/smartgrowth/pdf/sg\\_awards\\_2012.pdf](http://www.epa.gov/smartgrowth/pdf/sg_awards_2012.pdf)



### Västra Hamnen, Sweden



Västra Hamnen is a 400-acre re-development of a former industrial site with a current population of 4300. Aside from the iconic “Turning Torso” 54-storey tower, the development is also recognized for its ‘green’ transportation: 71% of trips are taken with modes other than cars (29% on foot, 31% by bike, and 17% by transit). It includes 8km of cycling paths; innovative road systems that give priority to cyclists and pedestrians; car-sharing; frequent bus service; reduced parking requirements; pricing of parking; and social marketing to promote sustainable choices. The community, which will eventually grow to 10,000 residents with facilities to serve an additional 20,000 employees and students, also provides dynamic public spaces and a waterfront location.<sup>6</sup>

### 5.3. Green: Green space, wildlife habitat, outdoor recreation, food and agriculture

Green space such as parks, open space and the urban forest is a critical component of the ecological and community health of any city. Green space provides valuable habitat and connections for wildlife, and provides ecosystem services such as rainwater infiltration and transpiration, water purification, and capturing carbon. Green space can therefore be considered the City’s “green infrastructure”.

Green space strengthens human connections to the landscape through passive and active recreation and provides an opportunity for enhancing local food systems and agriculture within the urban environment.

Small-scale biodiversity features such as wetlands, forest patches, streams, rain-gardens, butterfly gardens, green walls and green roofs, can enhance residents’ experience of nature in the city.

### Seattle’s Food Forest



The City of Seattle is constructing a seven-acre public food forest that will provide free food for area residents and visitors. The forest will feature fruit orchards, nut groves, and berry bushes among groundcover edibles, as well as community gardens.

<sup>6</sup> Foletta and Field, 2011: Europe’s Vibrant New Low Car(bon) Communities. <http://www.itdp.org>





### Green Walls

The Musée du Quai Branly, located in Paris near the Eiffel Tower, features a 13,000sf green façade that includes over 15,000 individual plants representing 150 species from around the world. The wall is the one of the most photographed in the world and invites passers-by to interact with and touch the plants<sup>7</sup>. In addition to adding beauty to the urban environment, green walls help to clean the air, cool the atmosphere, and can provide habitat and opportunities for growing food.



### 5.4. Build: Buildings, including renewable energy and energy efficiency

Buildings are responsible for significant environmental impacts, including a substantial share of community energy consumption, water consumption, greenhouse gas emissions, and waste. Construction methods and materials also have significant impacts including noise pollution, resource use, and habitat disruption, while building design influences indoor environmental quality, in turn affecting health and productivity of people living and working in those buildings. Renewable and efficient energy supports greener buildings and also helps with climate protection, energy security, reduced air pollution, and local job creation.

### Dockside Green, Victoria BC

Dockside Green is a 16-acre former industrial site located next to downtown Victoria that has been re-developed for a mix of residential, commercial and office uses. Bordering townhouses and a public greenway, a naturalized stream provides habitat and an aesthetic feature, and is fed by treated wastewater – which is also used to flush toilets. Heating is supplied with a district energy system that runs on wood waste biomass. As a result of these systems, combined with energy efficient buildings, the development generates about 50% less greenhouse gas emissions, and conserves 65% more water, compared to a standard development.<sup>8</sup>



<sup>7</sup> <http://www.greenroofs.com/projects/pview.php?id=553>

<sup>8</sup> <http://www.docksidegreen.com/>



## 5.5. Flow: Watershed management and water quality

Every living thing needs water to survive. Water connects our communities with other ecosystems as a rain drop travels from the land to feed forests, streams, lakes and the ocean. Restoring and maintaining healthy watersheds benefits these ecosystems as well as the livability of our community and our health.

Viewing water as one holistic resource (instead of as separate categories where only drinking water is valued and others – stormwater and wastewater – are regarded as ‘waste’) helps to think about opportunities to use water more wisely, and to save on costs. For example, rainwater can be harvested for drinking, irrigation, and aesthetic purposes, and returned to the soil to benefit ecosystems, while ‘sewage’ water can be treated to safely re-use for purposes such as toilet flushing and irrigation.

### Philadelphia’s ‘Green City, Green Waters’ Plan



Like many cities, Philadelphia has “combined” sewers (sanitary sewage and stormwater carried by a single pipe) which in moderate to heavy rains discharge untreated sewage directly into receiving water bodies. A traditional engineering solution to replace and upgrade the pipes was found to be cost-prohibitive and fixed only one problem. Instead, the City has committed \$2.4 billion over 25 years to its **Green City, Clean Waters** program which will reduce combined sewer overflows by restoring natural systems that keep stormwater out of the pipes, largely through the use of “green infrastructure” (e.g. trees, stormwater planters, green roofs, permeable pavement and constructed wetlands). The plan will also restore and “daylight” degraded and lost streams, and includes a variety of programs across all public and private lands. A return on investment is expected after 45 years, and the program is expected to yield a variety of social, economic and environmental benefits<sup>9</sup>.

## 5.6. Conserve: Materials and resource management

Management of materials and resources within cities has extensive implications for the environment, encompassing both “upstream” effects such as extraction and processing of resources for manufacturing, and “downstream” effects such as pollution and greenhouse gas emissions from landfills.

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<sup>9</sup> <http://phillywatersheds.org/>



Promoting reduced consumption, sustainable purchasing and recycling (including materials that fall outside mainstream recycling programs) offer opportunities to reduce these impacts, as well as to save costs.

### San Francisco

The City of San Francisco implemented a mandatory recycling and composting regulation and program for residents and businesses, achieving a 78% landfill diversion rate, with zero waste as the goal by 2020<sup>10</sup>. On the corporate side, each city department is required to develop its own individual action plans to reduce GHG emissions from its own activities as well as the private sector activities within its regulatory scope. The city's Department of the Environment coordinates green initiatives across departments and compiles annual progress reports.<sup>11</sup>



## 5.7. Breathe: Air quality, greenhouse gas (GHG) emissions and climate change

Reducing GHG emissions and improving air quality is important to address climate change, as well as to protect and improve health and livability. Climate change mitigation involves reducing human-caused GHG emissions and capturing more carbon, which, in an urban environment entails reducing fossil fuel consumption, reducing solid waste, and growing the urban forest. Strategies for adaptation are also necessary, to cope with the anticipated effects of a changing climate.

### Climate and Air Quality Examples

- **Copenhagen, Denmark** has one of the world's largest district heating systems<sup>12</sup> which supplies about 98% of the heating and hot water for the city's population of 500,000, resulting in a 40-50% reduction in GHG emissions compared to standard (building-scale) systems<sup>13</sup>.
- **In Oslo, Norway**, the city's buses run on *bio-methane produced from sewage*, a carbon-neutral, clean and renewable fuel, part of the city's goal to reduce carbon emissions by 50% by 2030. Residents of Oslo emit 2.2 tonnes of carbon per person<sup>14</sup> (compared to 22 t/person in Canada).

<sup>10</sup> <http://sfenvironment.org/zero-waste>

<sup>11</sup> <http://www.siemens.com/entry/cc/en/greencityindex.htm>

<sup>12</sup> District heating systems are neighbourhood-scale energy centres that can be powered by various types of fuel ranging from natural gas to biomass to geothermal sources.

<sup>13</sup> <http://www.copenhagenenergysummit.org/applications/Copenhagen,%20Denmark-District%20Energy%20Climate%20Award.pdf>

<sup>14</sup> <http://www.ecomagination.com/top-five-most-sustainable-cities-in-the-world>



- The **City of Edmonton** recognized that many trees in the city were already dying due to climate related effects; at the same time, trees are known to clean the air and to help buffer and mitigate climate change. This was the catalyst for development of an **urban forest management plan** to address the long-term health of the city’s treed ecosystems.<sup>15</sup>

### 5.8. Prosper: Greening of business and the economy

Sustainable economic practice is, in theory, modeled on nature’s cycles of efficiency, resource re-use, and beneficial cycles. There remains a great deal of work to do to bring current business practice in alignment with this vision, but forward-looking companies recognize both a societal responsibility and a business case for adopting sustainable practices.

#### Interface-FLOR Carpets – a Green Business Case Study

Interface-Flor Carpets is the world’s largest carpet tile manufacturer. In 1994, president and CEO Ray Anderson had an “epiphany” – realizing that industry is a major culprit in worldwide pollution, habitat destruction and species extinctions. Since that time, he set a new direction for the company: to reduce the environmental footprint to zero by 2020. By improving efficiencies, using recyclable and rapidly renewable fabrics, shifting to renewable energy, and taking back and re-using carpet tiles at the end of their lifespan, the company emulates a “closed-loop” system and is approaching that goal: to date it has reduced waste by 81% reduction and GHG emissions by 32%, while also improving the bottom line.<sup>16</sup>



### 5.9. Manage: Governance and corporate programs

To demonstrate leadership, cities must continue to improve environmental performance within their facilities and operations. This includes all buildings, the municipal vehicle fleet and equipment, infrastructure, supplies and materials, and operating building, parks, and public spaces. Cities can also establish sustainability expectations and criteria for their tendered contracts.

Municipal bylaws and policies play a large role in how the cities are developed, and require periodic updates to ensure they continue to meet the specific needs of the community, in light of its sustainability goals.

<sup>15</sup> <http://www.nrcan.gc.ca/earth-sciences/climate-change/community-adaptation/municipalities/682>

<sup>16</sup> <http://www.interfaceglobal.com/Sustainability/Interface-Story.aspx>



### The City of Calgary's Corporate Responsibility

The City of Calgary uses a Triple Bottom Line decision-making approach for all of the City's actions and operations. An internal ISO 14001-registered Environmental Management System helps identify, track and improve the City's performance and decision-making. A rigorous Sustainable Environmental and Ethical Procurement Policy is used to minimize negative impacts on society and the environment. The City has multiple LEED-rated corporate facilities, and has installed solar thermal to help heat Leisure Centre pools. Calgary was awarded the Green Champion Award by FCM in 2011.<sup>17</sup>



## 6. Burnaby's Strategic Advantages

Through development of the ESS, Burnaby is at an ideal position to capitalize on the inherent opportunities available within the many different themes of sustainability.

For example, strategically we can:

- ***Continue to lead the way:*** We can leverage our location, experience and diversity and look for ways to make the most of the resources we have available. We can continue to set a corporate example with the city's policies, regulations, programs and operations. We can afford to take risks.
- ***Develop an innovation hub:*** Burnaby has the potential to draw on its deep intellectual capital, including two post-secondary academic institutions, a diverse cultural community and a strong 'clean tech' economic sector, to develop unique solutions to many environmental challenges.
- ***Engage our community & build partnerships:*** We can engage key community stakeholders and citizens to encourage them to take action in partnership with the City. Through the ESS process we can build consensus through listening, dialogue, teaching, and learning together. We can confirm and validate the core values of the community. We can build community during the ESS-based community dialogue process.
- ***Prepare for the future & challenge conventional wisdom:*** We can review trends, ask the experts for their views, share knowledge, look to international examples; we can take advantage of urban 'green infrastructure', leverage the innovative merging of technology and ecology, and challenge conventional environmental wisdom.

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<sup>17</sup> In the same year, Mayor Corrigan was awarded the "Green Champion-Individual" award by the FCM: <http://www.fcm.ca/home/awards/fcm-green-champions-awards/2011-recipients.htm>



- **Leverage our strategic location:** To enhance our ethic of environmental stewardship and connection with nature, we can take advantage of green open space that abounds within the City limits and recognize our strategic location at the mouth of the Fraser River, the province’s most important Salmon River, and a doorstep to the natural wilderness. Located within a region forming the largest city of the province, we are well placed to take advantage of economic and intellectual opportunities afforded by international trade idea exchange.
- **Build on previous success:** We already have an excellent track record of world class initiatives. These can serve as living laboratories from which we can learn and build.

## 7. Developing a Strategic Framework

In order to capitalize on these strategic advantages and to address the challenges and opportunities outlined in this report, the ESS will cast a vision for the future that focuses, strengthens and refines Burnaby’s approaches to environmental protection and enhancement, to support the City’s environmental, social and economic objectives. An implementable strategic framework of theme-based goals, objectives and specific actions, will be developed to support this vision. This framework will need to recognize the benefits of identifying and making progress toward goals, objectives and actions identified in the short term (“*quick wins*” *within 5 years* to build momentum), medium term (e.g. *5 to 20 years*), and long term (e.g. *up to 100 years*).

The strategic framework developed as part of the ESS will need to recognize resource limitations and the challenges of balancing the many needs of a community, often in changing economic and political circumstances. The ESS will therefore need to:

- seek outcomes that are simple and easy to understand;
- avoid the challenges of complex reporting requirements;
- avoid the need for cost-prohibitive monitoring;
- minimize the need for additional staff resources; and
- ensure the effort is economically, socially and environmentally viable.

**Indicators** and **targets** are often applied as part of strategic frameworks in order to track progress, report back to the community and build support through positive reinforcement. At the same time, targets and indicators need to be practical and manageable, and their primary purpose – to set direction, rather than to promise results - need to be clearly communicated to the public and stakeholders, in order to manage expectations. As the ESS Framework is developed in the coming months, the ESS Steering



Committee will need to consider whether the use of indicators and targets is appropriate for the ESS.

## 8. Burnaby's Toolbox and Relationships

Tools that Burnaby can draw upon to leverage success in the ESS include: *policies and plans; regulations; programs; people and processes; and place-based projects.*

The effectiveness of these tools depends on the strength and quality of relationships Burnaby has with its citizens and other stakeholders, including formal and informal partnerships, education, and formal civic engagement in processes such as the ESS.

In considering how best to use Burnaby's toolbox, we should begin with the end in mind and think about implementation from the very beginning. We must also be aware of the limits of the City's role and jurisdictional limits. For example, the City has substantial control over land use, but not public transit, while neighbouring jurisdictions affect traffic flow and air quality.

Specific examples of how these tools have been used to date are described in the companion report, *Burnaby's Environmental Achievements – a Burnaby ESS Context Report.*

## 9. Conclusion

Like all other species, we live within **ecosystems** which are contained within and interact with our **environment**. Unlike other species, however, we can make choices about the extent to which our activities support healthy natural processes which will influence the long term well-being of our society.

Healthy ecosystems are built on cycles which generate beneficial relationships and outcomes. Emulating these cycles requires a transition from “green” (reducing impacts) to “regenerative” (providing positive benefits). Fortunately, there are many tools, innovative examples, and worldwide trends that we can draw from on our journey toward sustainability. This makes “now” the ideal time for action.

Environmental sustainability includes a broad array of themes, which are depicted here within a 9-petal framework. There are unlimited opportunities within each ‘petal’ or focal area for initiatives that can make our city more resilient, livable and prosperous.



The ESS is therefore taking place at an ideal time, allowing us to learn and build on our strengths, and recognize the opportunities for integrating the social, economic and environmental aspects of a sustainable city.

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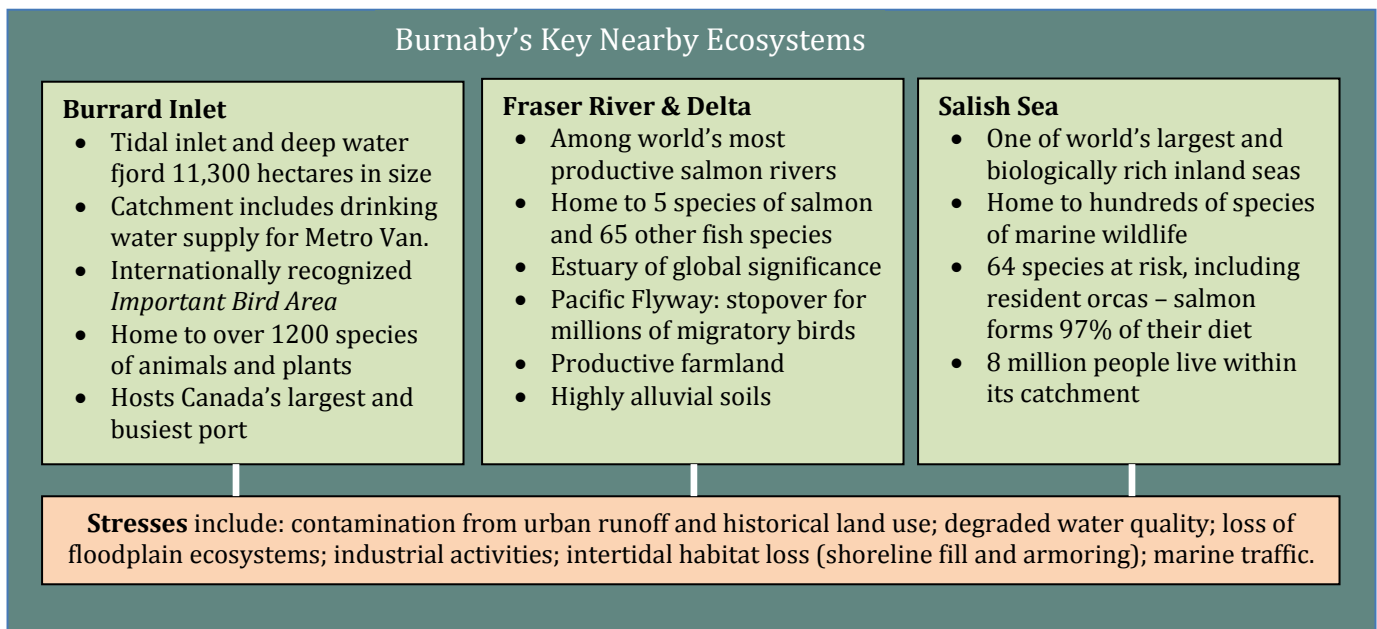


## APPENDIX A – Burnaby’s Environment and Ecosystems

Our environment is our **surroundings** which sustain us – the air we breathe, the earth we walk on, the places we live, work, learn and play. A healthy environment in turn supports healthy ecosystems<sup>18</sup>, vibrant and prosperous communities, and personal health and well-being.

Burnaby has a land area of 98km<sup>2</sup> and a population of about 225,000 people, and is the third most populous municipality in British Columbia. Our region of Metro Vancouver in turn represents around half of BC’s population and has a diverse economy, a high ethnic diversity, vibrant culture, and is located amid a spectacular west coast setting, offering a quality of life recognized as being one of the highest in the world.

Burnaby borders and influences two ecosystems of regional and global significance: **Burrard Inlet** and the **Fraser River**. All of Burnaby’s stormwater and streams ultimately flow into one of these two marine areas, which also form part of the **Salish Sea**, the marine water body encompassing Georgia Strait, Juan de Fuca Strait, Howe Sound and Puget Sound (**Figure 6**). These linkages demonstrate that our actions can influence many other species, from salmon to eagles and orcas.



Burnaby’s streams, wetlands, and forested areas are the most visible ecosystems in the City and many are protected within the extensive parks and conservation area lands, including

<sup>18</sup> An ecosystem consists of diverse living organisms interacting with each other and with their environment.



Burnaby Lake Regional Nature Park, Burnaby Mountain Conservation Area, Deer Lake Park, and ravine parks in Burnaby's south slopes. Burnaby also has productive farmland in the Big Bend area, established on rich deposits from the Fraser River, which contributes to local food supply and the region's food security. Other urban ecosystem components include trees and vegetation at all scales, from backyard gardens, to street boulevards, to rooftops, which all play a role in the natural processes that sustain a high quality of life for residents of the City.

*Figure 6. Burnaby's context amid significant ecosystems*



## APPENDIX B – Challenges and Opportunities

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### 1. Governmental Leadership

#### *Challenges*

Responsibilities for a variety of services, including environmental protection, are increasingly being downloaded to local government, while leadership at the national and international level is lacking to address many of our most pressing environmental concerns. At the same time, citizens often look first to their local government. This creates a challenge to deliver on expectations, while sometimes constrained by limited jurisdiction and ability to fund new initiatives without increasing the tax burden.

#### *Opportunities*

Municipalities are increasingly acting as champions of sustainability. A municipality has the ability to control and regulate urban development, transportation, environmental protection and waste management, among other strong drivers of sustainability; it also has a close connection with citizens, enabling direct engagement, communication and education. Worldwide, local governments are stepping up to address global challenges at a local scale, such as climate change.

In seeking ways to reduce the tax burden, opportunities may be found in identifying complementary, multi-purpose infrastructure and services (e.g. complete streets; greenways that provide recreation, rainwater management services, ecosystem connectivity and carbon capture).

### 2. Ecosystem Health and Biodiversity

#### *Challenges*

Biodiversity – the variety of species and their habitats – plays an important role in ecosystem function and the services healthy ecosystems provide. Due to a number of human influences - climate change, habitat loss, pollution, over-hunting/fishing and introduced alien species – current rates of species extinction are 1,000 to 10,000 times the ‘natural’ or background rate<sup>19</sup>. The Millennium Ecosystem Assessment study, completed in 2005, found that 60% of the ecosystems evaluated were critically impaired in their ability to perform important ecosystem services.

Locally, Burnaby’s ecosystems are subject to habitat fragmentation, damage from past land use, and invasive species.

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<sup>19</sup> IUCN 2007: [http://cmsdata.iucn.org/downloads/species\\_extinction\\_05\\_2007.pdf](http://cmsdata.iucn.org/downloads/species_extinction_05_2007.pdf)



### *Opportunities*

Although we cannot restore the landscape to support the same species that were present before Burnaby was developed, we can enhance existing protected ecosystems and restore new areas as a part of new development. Ecosystem restoration, sometimes achieved through development of former industrial lands, is a regenerative approach that heals our relationship with the land. This approach can flow from an inspirational vision wherein human development actually enhances the ecosystem of which people form a part. Development of lands contaminated by historical activities (“brownfields”) offers multiple benefits including remediating contaminated soils, restoring natural ecosystems, and freeing up land for urban redevelopment.

Burnaby’s urban structure, which is already strongly related to natural areas, can be further strengthened with initiatives to control invasive species, restore key areas and enhance connectivity between habitat patches.

## **3. Increasing Consumption and Population; Resource Scarcity**

### *Challenges*

Compared to the large majority of other countries, Canadians consume more resources and produce more waste (and greenhouse gases) per person. The levels of consumption exceed the carrying capacity of the planet; if everyone consumed as much as we did, we would need four Planet Earths to sustain the world’s population. This population is expected to reach 8.9 billion by 2050<sup>20</sup>. People in other nations that were historically more limited by poverty are understandably seeking to adopt a lifestyle similar to our own. The materials, food and water required to meet the needs of the world’s people are of course limited, and already 870 million people do not get enough food to be healthy and lead an active lifestyle<sup>21</sup>.

Since we rely largely on distant sources of food and materials, worldwide shortages are likely to lead to higher prices locally, which puts strain on low and medium income individuals and families, and harms our economy.

### *Opportunities*

Our biggest opportunities are centred around adopting a modest and responsible lifestyle, which can set a positive example for the world. This includes reducing consumption, supporting local initiatives for food and materials, purchasing products that are ethically produced, and reducing waste. Local initiatives can also stimulate the local economy, and

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<sup>20</sup> United Nations, 2004: World Population to 2300

<http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf>

<sup>21</sup> World Food Programme 2013: <http://www.wfp.org/hunger>



improve the security of our resource supplies. We need to continually improve existing program to reduce consumption and waste, and innovate with other initiatives, in order to address this challenge.

## **4. Energy and Fossil Fuels**

### *Challenges*

Fossil fuels (coal, oil and natural gas) in effect define our modern society – they are used as a basis for everything from transportation, to heating and power supply, to the production of plastics and pharmaceuticals, to food production and delivery. Although estimates differ wildly about how long the supplies of these fuels will last – and more importantly, how long they will remain relatively cheap – they are undeniably a finite resource: it takes millions of years for heat and pressure in the earth to transform organic matter into a fossil fuel.

Burning and extraction of fossil fuels is the largest source of human-generated greenhouse gases. There are also risks to the environment and geopolitical stability associated with the extraction, transportation and use of these fuels.

Local effects include risks to the environment due to fossil fuel transportation and processing; rising food prices (linked to the price of oil); air pollution associated with fossil fuel combustion; rising gasoline prices; and limited energy security.

### *Opportunities*

A move toward increased active transportation – walking, cycling and public transit – can help to save money, improve health and reduce health-care costs, for a healthier and wealthier citizenry. Other opportunities include improving energy efficiency in older buildings, implementing district energy systems, and shifting to renewable energy sources for building heating. In addition to reducing air pollution and greenhouse gases, renewable/local energy can help to mitigate risks, contribute the local economy and improve energy security.

## **5. Climate Change**

### *Challenges*

Increasing levels of greenhouse gases (GHG) are contributing to changing global climatic patterns, including warming average temperatures, rising sea levels, and increasing severity of extreme weather events, which threaten human security and the ecological balance on which humans depend.



Regionally, we can expect more extreme weather (rainfall/drought/wind and snow storms) and sea level rise, with likely effects including increased flooding of low-land and marine shoreline areas; increased stress on ecosystems and agricultural productivity; more heat- and air-quality-related deaths; and declining drinking water supply. There may also be social and economic effects due to increased immigration from more severely affected regions of the world.

### *Opportunities*

Climate change planning includes both **mitigation** (reducing greenhouse gases to lessen one of the main causes of climate change<sup>22</sup>), and **adaptation** (ensuring our systems are resilient, to respond to the expected effects of climate change).

Shifting from fossil fuels to renewable energy, a mitigation strategy, can also improve air quality and livability, add to economic security, and stimulate innovation and economic growth in “green” technologies, which represent a significant component of Burnaby’s business sector.

Encouraging a shift in transportation modes to walking and cycling helps to reduce GHG emissions from automobiles, and improves health and community livability.

Adapting to climate change also offers opportunities to enhance ecological health and livability. For example, to cope with increased rainfall, some rainwater can be managed with decentralized ‘green’ systems such as *rain gardens*, which absorb runoff near where it falls, while also replenishing groundwater, filtering pollutants and enhancing the urban streetscape; this can defer to eliminate the need to upgrade stormwater pipes, a very expensive solution that does not offer as many benefits. Rain gardens can also include street trees, which help to capture carbon and improve air quality.

## **6. Advances in Technology**

### *Challenges*

Our future has been sometimes imagined through science-fiction as an age where high-technology dominates. We have discovered however that while there is an important role for technology, it will never replace the function of ecosystems for production of food and materials, and human health and well being. The proliferation of ‘gadgets’ also results in increased waste, much of it being difficult to re-use or recycle, and increases demand for electricity.

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<sup>22</sup> The most recent International Panel on Climate Change concluded that global emissions of greenhouse gases need to peak before 2015, with 50% to 95% reductions below 2000 levels by 2050, if we are to avoid climatic tipping points that will cause dangerous disruptions, such as severe agricultural collapses, water shortages, droughts and sea level rise (IPCC 2007a).



### *Opportunities*

There are many technologies that can play an important role in a transition to a ‘no waste’ society, such as manufacturing and recycling processes, electric vehicle technology, waste treatment systems, and internet and social media deployed to engage and communicate about environmental issues. Some “new” technologies are really re-inventions or improvements on older technologies, such as *biochar*, which is a soil amendment created from waste organic matter through a special combustion process, that also has the potential to capture carbon for climate change mitigation.

## **7. A Globalizing Economy and Society**

### *Challenges*

Since 1950, the volume of trade has expanded by 20 times, encompassing the entire globe and integrating into many aspects of peoples’ lives, such as purchasing, travel and communication. Supported by cheap oil, goods are often produced far from the destination markets, in conditions that exploit weak local regulations for human welfare and environmental protection. The financial crisis of 2008 and ongoing debt related concerns have revealed that our economies are propped up by leveraged capital, and are currently over-dependent on declining natural resources and not fully accounting for the burdens that wastes put on society and future generations.

Locally, we are at risk of losing jobs to outsourcing, disruptions in consumer goods supply chains due to distant events out of our control, increasing economic disparity, and disruptions in global financial markets.

### *Opportunities*

Enhancing our local economy by developing and promoting locally produced goods and services represents an antidote to excessive globalization that builds local capacity and can also reduce GHG emissions and other environmental impacts associated with long-distance shipping.

Expanding social interconnections via social media presents opportunities for sharing knowledge, such as learning from leading international examples of policies and practice in sustainability. Meanwhile, citizens themselves are more empowered to collaborate with others and develop grass-roots solutions through digital and social media.

Growth needs to be re-framed in terms of prosperity or well-being, rather than primarily in terms of increased income and acquisition of goods and services.



## **8. Urbanization**

### *Challenges*

More than half of the world's population now lives in cities. Cities are responsible for a large percentage of the world's resource use and greenhouse gas emissions, contributing to ecosystem degradation and climate change<sup>23</sup>. City residents must work together to respond to the challenges of living in close proximity and managing constrained resources and land use, including waste management, pollution and transportation. Poorly regulated development can lead to inefficient urban structure ("sprawl"), increased greenhouse gas emissions, and the loss of critical ecosystems.

### *Opportunities*

Cities also represent hubs of creative power and innovation; leading design, planning, transportation and technology approaches are typically developed in cities. With good planning, key ecosystems can be preserved and enhanced, including within the fabric of highly urban areas as well as in lower density areas.

## **9. Local Population Growth and Demographic Changes**

### *Challenges*

Projected population increase and demographic changes will place increased demands on the City's systems and land base. The movements of people, population age profile, and family size, have been major factors in determining requirements for infrastructure, housing types and numbers, social programs, accessibility, and recreational facilities.

If not managed well, an increased population could increase the burden on systems such as waste management, transportation, parks and natural areas, as well as on systems over which Burnaby has limited jurisdiction (e.g. education, health care).

### *Opportunities*

Learning from the world's most economically vibrant and ethnically diverse cities, population growth and densification can be encouraged in appropriate areas, which also can reduce the overall development and consumption footprint while simultaneously creating a more vibrant city.

Additional opportunities for higher density development near transit stations can be explored, with a greater mix in land use and greenspace. Redevelopment offers the opportunity to establish a greater range of housing types and to improve accessibility and quality of parks and recreational facilities.

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<sup>23</sup> IPCC 2007 Synthesis Report.

